

**The Growth of Environmental Equity within the UVA and  
Local Charlottesville Community**

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On my honor as a University Student, I have neither given nor received unauthorized aid on  
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## **Introduction**

What is your carbon footprint? What about nitrogen? When people think about sustainability their minds always resort back to these two questions that have determined the global conversation about climate change and its progress. But what about the other factors? What about the ideas of waste mitigation systems and their efforts? The idea of sustainability has emerged as a paramount concept in society, reflecting the growing awareness of the need to harmonize economic, environmental, and social goals. In a world characterized by rapid population growth, resource depletion, climate change, and social inequities, the goal of sustainability has become a moral and practical imperative. In many cases, this idea involves practices and strategies aimed at preserving the well-being of current and future generations while also protecting the health of the planet's ecosystems. Within the broad topic of sustainability there are many sectors that not only acknowledge the call for action for our planet, but ourselves and our neighbors. The health of the planet is the primary factor of this topic, but humanity's impact is the largest contributing factor in the depletion of our ecosystem.

The STS field has long examined the impacts of science and technology on society and the environment. It emphasizes the idea that scientific and technological advancements are shaped by social and cultural factors, and, in turn, they influence society. In the context of sustainability, STS provides valuable insights into how the development and deployment of technologies affect the environment and society, therefore informing sustainable practices. STS contributes to sustainability by examining the risks associated with technological innovations and environmental changes. This informs strategies to manage these risks and mitigate potential negative consequences. Some examples of mitigation come from integrated systems of waste

management, “integrated waste management strategies can be significantly beneficial and impactful in multiple ways compared with the outcomes of traditional isolated initiatives of waste management.” (1, Hussain, 2022). These systems include recycling, composting, and disposal programs, however, accessibility to these resources have been questioned over the past decades leading to the underlying topic and issue of environmental justice to be studied and broadly introduced to society.

This essay is focused on examining the progress of environmental equity efforts through systems such as waste mitigation, educational strategies, and stewardship within the past 10 years specifically at the University of Virginia (UVA) weaving into the local Charlottesville community. Focusing on these three specific systems allows for these sectors to be examined and judged in two different aspects: its environmental contribution and their STS meaning and involvement in society.

The essay embarks on a comprehensive exploration of waste mitigation systems, starting with a literature review to delineate their significance within the context of sustainable development. It delves into the various strategies encompassed by waste management, ranging from recycling to waste-to-energy technologies, tracing their evolution and impact on environmental sustainability and awareness.

Following this groundwork, the analysis section dives into the connection between waste mitigation systems and environmental justice. It elucidates how technical systems deployed in waste management contribute to addressing pertinent issues such as equitable distribution of waste facilities and pollution. Drawing upon pertinent programs and archival data,

the section constructs a compelling argument, supplemented by addressing potential counterarguments, thus establishing a cogent narrative. Furthermore, the review focuses on UVA's numerous sustainability endeavors, serving as a case study.

The essay ends in a succinct yet insightful conclusion, synthesizing the key findings from the literature review and analysis. It proffers recommendations for future research, underscoring the imperative for ongoing efforts to augment the efficacy of waste mitigation systems in advancing environmental justice. Additionally, it reinforces the pivotal role of academic institutions like UVA in spearheading sustainable initiatives and fostering a culture of environmental stewardship.

## **Literature Review**

Environmental justice can be described in the following way: “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” (EPA, 2014). Environmental justice embodies the fundamental principle of equitable treatment and active engagement for all individuals, irrespective of their racial background, nationality, or economic status, within the realm of environmental governance. It is a concept grounded in the notion of fairness, demanding that every person has the right to participate meaningfully in decisions concerning environmental laws, regulations, and policies. This principle recognizes the interconnectedness between environmental issues and social inequalities, aiming to address systemic disparities in the distribution of environmental benefits and burdens. By championing environmental justice, societies strive to create inclusive

and sustainable solutions that uphold the rights and dignity of all people, fostering a healthier and more equitable future for generations to come.

In general, “Over 30 years of research has documented that poor and/or minority populations face disproportionate exposures to environmental pollution. This finding has given rise to an environmental justice movement seeking to address such inequities” (378, Banzhaf, 2019). Disadvantaged members of communities are more likely to be impacted by environmental justice issues due to the lack of resources and education in the broader topic of sustainability. Regarding sustainability efforts and the presence of environmental justice issues in the UVA and Charlottesville communities, there has been an unproportioned level of access to waste mitigation systems and education resulting in a divide between the two communities. Although efforts have been made to address waste mitigation systems throughout Virginia as a whole, “recycling rates have only improved 10% over the last two decades” further proving that this problem is one that needs to be addressed (Vazarkar, 2022). The acknowledgement of this problem has caused me to understand that it is important that these efforts be studied in order to understand the environmental justice problem as a whole in the Charlottesville community in specific at UVA.

Science and Technology Studies (STS) offer a captivating lens through which to understand the intricate relationship between technical systems and contemporary politics.

“disadvantaged members of society typically bear the brunt of the environmental impacts of human activity. Therefore, an essential part of attaining social justice is enabling the members of the community who will be adversely affected by these impacts to participate

in and have rights of review in relation to the making of environmental laws, decisions about land use and development and enforcement of environmental laws.” (Millner, 2011).

The above quote acknowledges the fact that STS theory of the relationship between infrastructures and power plays a vital role in the topic of environmental justice by shedding light on how power dynamics shape the distribution of environmental benefits and burdens. This idea is highlighted by Winner when he states, “Technical systems of various kinds are deeply interwoven in the conditions of modern politics”, and they “embody specific forms of power and authority” (121, Winner, 1980). The interplay between infrastructures and power becomes evident in the unequal distribution of environmental benefits, with privileged groups often enjoying better access to resources and cleaner environments. Simultaneously, marginalized communities bear a disproportionate burden of environmental degradation, as seen in their exposure to pollution and lack of access to sustainable practices. STS theory underscores that these disparities are not accidental but are shaped by power dynamics that influence decision-making processes related to environmental policies and infrastructural development. Recognizing the centrality of power in these dynamics is crucial for addressing environmental justice comprehensively, advocating for inclusive policies, and dismantling systems that perpetuate environmental inequalities. In essence, STS theory serves as a lens through which we can understand and address the systemic issues that contribute to the unequal distribution of environmental benefits and burdens in society.

The design and implementation of waste management infrastructure can reflect certain political and social priorities. For example, if waste mitigation systems are designed primarily for affluent neighborhoods or urban centers, this can perpetuate socio-economic disparities, leaving marginalized communities with inadequate waste disposal options. The significant proportion of waste being landfilled (73%) compared to the much lower percentages being incinerated (12%) or composted (1%) indicates a heavy reliance on landfilling as the primary disposal method (Virginia.gov, 2022). This suggests potential inefficiencies in waste management practices, as landfilling is often considered the least sustainable option due to its environmental impacts. Through rigorous analysis and critical inquiry, STS compels one to recognize the profound impact of technical systems on modern politics, emphasizing the imperative of understanding and navigating these intricacies to foster equitable and inclusive societies.

## **Methods**

Over the past decade, the Office of Sustainability (OFS) and the city of Charlottesville have amassed a wealth of information within their archives and files. This data repository serves as a comprehensive record of sustainability efforts and initiatives undertaken by various stakeholders. At the heart of these endeavors lies the Office of Sustainability here at the University of Virginia (UVA), a pivotal entity tasked with orchestrating sustainability initiatives across campus. This office not only coordinates but also implements strategies aimed at advancing sustainability objectives, thereby nurturing an ethos of environmental stewardship within the university community. Central to my investigation is an exploration of OFS's 10-year

plan, a blueprint delineating UVA's and the surrounding community's strategies and objectives to tackle environmental challenges, exposure to waste mitigation systems, and promote equity.

Delving into these archives, my goal is to decipher the narrative underlying the distribution of environmental benefits and burdens within the local community. By adopting this approach, I seek to contextualize my research within the lived experiences and historical realities of the community, thereby elucidating the intricate interplay between infrastructural frameworks, power dynamics, and environmental equity.

### **Analysis**

Information and Communication Technologies (ICTs) play a crucial role in shaping power dynamics within waste mitigation efforts, impacting access to vital information and participation in recycling programs. “Recycling continues to be one of the most important ways to divert material from landfills, but recycling rates have only improved 10% over the last two decades<sup>6</sup> and recent changes in recycling markets hurt operations around the Commonwealth.” (Virginia.gov, 2022). In the context of waste mitigation, ICTs can influence access to information about waste disposal practices, recycling programs, and environmental regulations. Lack of access to these technologies, such as internet connectivity or digital literacy, can exacerbate disparities in waste management knowledge and participation. Despite the availability of recycling facilities and programs, the overall recycling rate in Virginia is 45.5%, indicating that a substantial portion of recyclable materials are still being disposed of in landfills or through other methods. This may suggest shortcomings in recycling infrastructure, public awareness, or participation in recycling programs.



The University of Virginia's Office of Sustainability released its 10-year plan in 2020, outlining strategic goals and initiatives to enhance sustainability across campus. The plan focused on various areas including reducing greenhouse gas emissions, promoting energy efficiency, advancing sustainable transportation, enhancing waste management, supporting sustainable food systems, and fostering a culture of sustainability within the university community. It aimed to integrate sustainability principles into all aspects of campus operations, academic programs, and student life, with a commitment to addressing environmental challenges and promoting resilience. The plan outlined specific targets and actions to achieve measurable progress towards a more sustainable future for the University of Virginia ( University of Virginia Sustainability 2020-2023, 2020).

The implementation of sustainability systems as outlined in the University of Virginia's 10-year plan plays a crucial role in addressing environmental equity issues. By promoting sustainable practices, these systems aim to mitigate environmental injustices and ensure equitable access to clean air, water, and resources for all members of the university community, particularly those historically marginalized or disproportionately affected by environmental hazards. Sustainable energy initiatives, such as investments in renewable energy sources and energy efficiency upgrades, contribute to reducing greenhouse gas emissions and air pollution. “In FY 2014-15, energy-saving activities yielded more than \$4.6 million in avoided costs and almost 14,000 tons of avoided greenhouse gas emissions (GHG) as calculated in terms of metric tons of carbon dioxide equivalent (MTCDE)”(5, University of Virginia Sustainability Annual Report, 2022). This directly benefits communities near the university and beyond, especially

those residing in low-income areas or communities of color that often bear the brunt of environmental pollution. “Greenhouse gas emissions have been reduced 4.96% since 2009, despite 1.7 million square feet in growth and a 6.3% increase in population”(7, University of Virginia Sustainability Annual Report, 2015). By transitioning towards cleaner energy sources, the university can help alleviate the health disparities and environmental injustices faced by these communities.

Sustainability systems are integrated into academic strategies to educate and empower students, faculty, and staff to address complex environmental challenges through interdisciplinary learning and research. Academic programs may incorporate sustainability-focused courses, majors, and minors that explore topics such as renewable energy, environmental policy, sustainable design, and climate change adaptation. “U.Va. currently offers over 160 undergraduate and over 150 graduate sustainability-focused or sustainability-related courses, with many included in the Global Studies – Environments + Sustainability Major and the Global Sustainability Minor. Additionally, 24 departments currently engage in sustainability-related research”(5, University of Virginia Sustainability Annual Report, 2014). Furthermore, research initiatives may prioritize sustainability-related issues, fostering innovation and collaboration across disciplines to develop practical solutions for environmental sustainability and social equity. By integrating sustainability into the academic curriculum and research agenda, the university equips its community with the knowledge and skills needed to contribute to a more sustainable future. “UVA students continue to be passionate sustainability leaders. Students volunteered over 5,500 hours in sustainability service projects and helped

organize over 85 events this academic year to raise awareness and enhance UVA's excellence in sustainability" (5, University of Virginia Sustainability Annual Report, 2017). Furthermore, integrating sustainability principles into academic programs and research endeavors fosters environmental literacy and empowers students to become advocates for environmental justice as supported in the above quote. Overall, the utilization of sustainability systems as part of the university's broader commitment to sustainability serves as a powerful tool for advancing environmental equity and promoting justice for all communities, both within the university campus and beyond.

Sustainable systems are demonstrated through stewardship by emphasizing responsible management and conservation of resources across campus. This involves implementing energy-efficient technologies, such as LEED certified and smart building systems, to reduce energy consumption and minimize environmental impact."UVA has achieved 78 LEED certifications, including at the College of Wise, representing over 4.5 million square feet of building space"(7, University of Virginia Sustainability Annual Report, 2022). Additionally, stewardship initiatives may include habitat restoration projects, water conservation efforts, and sustainable land management practices that preserve biodiversity and ecosystem health. "With more than 550 buildings spanning 18 million square feet and numerous construction projects supporting growing schools and programs, UVA's environmental footprint would continue to increase in tandem without deliberate action. UVA is reducing this impact through multiple and interconnected programs focused on reducing energy use, water consumption, waste and toxic materials" (22, University of Virginia Sustainability Annual Report, 2022). By promoting

stewardship, the university not only reduces its environmental footprint but also sets an example for responsible resource management within the broader community.

Sustainability systems are demonstrated through waste mitigation systems by implementing strategies to reduce, reuse, and recycle waste generated on campus. This may involve establishing recycling and composting programs, implementing waste reduction initiatives, and promoting sustainable purchasing practices to minimize waste generation and divert recyclable materials from landfills. This benefits communities adjacent to waste disposal sites, which are often low-income communities or communities of color disproportionately impacted by the negative environmental and health effects of landfills and incinerators. At UVA's Amphitheater, “a test of a single compost bin expanded to a fleet of rotating bins in response to the significant quantity of compost being collected. The key to success was the support from the Zero Waste student ambassadors who sorted the material in the bins and removed non-compostable items” (34, University of Virginia Sustainability Annual Report, 2021). Additionally, waste mitigation systems may include initiatives to raise awareness about waste management issues and encourage behavior change among students, faculty, and staff. In 2021, UVA formed a working group, led by OFS and including more than 40 representatives from across the University, which implemented a robust communications strategy to ensure transition to compostable and reusable materials and other options. By effectively managing waste, the university not only reduces its environmental impact but also contributes to the conservation of natural resources and the protection of ecosystems.

Additionally, sustainable transportation efforts, such as promoting walking, cycling, and public transit, not only reduce carbon emissions but also enhance mobility options for all members of the university community, regardless of socioeconomic status. Improving access to affordable and sustainable transportation can help address transportation-related inequities, such as limited access to reliable transportation options in underserved areas or financial barriers to car ownership.

## **Conclusion**

Throughout all the archives examined, one may notice the financial support needed in order to have an impactful sustainability goal. One may argue that in general UVA's progress has been applauding when examining technical systems in the aspect of STS and sustainability, but in many ways costly. While there are valid concerns about the financial costs of implementing renewable energy sources and energy efficiency upgrades, it's important to consider the long-term benefits and potential cost savings associated with these sustainability initiatives. Investing in renewable energy and energy efficiency measures not only aligns with UVA's commitment to environmental stewardship but also offers significant financial advantages over time. Renewable energy sources, such as solar and wind power, offer a stable and predictable energy supply, reducing the university's exposure to volatile energy prices and mitigating the financial risks associated with reliance on fossil fuels. Furthermore, energy efficiency upgrades can yield substantial cost savings through reduced energy consumption and lower utility bills, providing a tangible return on investment that contributes to the university's financial sustainability in the long run.

Moreover, transitioning to renewable energy and implementing energy efficiency measures can enhance UVA's reputation as a leader in sustainability, attracting environmentally conscious students, faculty, and donors who prioritize sustainability in their decision-making. This can result in increased enrollment, philanthropic support, and research funding opportunities, further bolstering the university's financial resilience and competitiveness.

Additionally, investing in sustainability aligns with UVA's broader mission to prepare students for a rapidly changing world by fostering critical thinking, innovation, and environmental responsibility. By integrating sustainability principles into academic programs and campus operations, the university equips students with the knowledge and skills needed to address complex environmental challenges and contribute to a more sustainable future.

The demonstration of sustainability systems through stewardship, academic strategies, and waste mitigation systems showcases the University of Virginia's commitment to integrating sustainability into various aspects of its operations and fostering a culture of environmental responsibility. Further research could be done examining the same type of documents but on a larger scale. Research could examine the intersection of sustainability and social equity, with a focus on addressing environmental justice issues within the university community and surrounding areas. This could involve conducting participatory research to understand the needs and priorities of marginalized communities, evaluating the distributional impacts of sustainability initiatives, and developing strategies to promote equity and inclusion in sustainability efforts.

This essay highlights UVA's efforts in hope to show the correlation between STS and sustainability through technical systems supported by University efforts. Overall, by examining the progress of environmental equity efforts through systems such as waste mitigation, educational strategies, and stewardship the University of Virginia exemplifies its commitment to advancing environmental sustainability and promoting stewardship of natural resources within its campus community and beyond. UVA is setting many examples for green universities compelling those to use its progress as a call to action that demands the public's attention.

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